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ABSTRACT

This monograph attempts to provide an overview of current educational issues that affect brain-injured students with special emphasis on the assessment process. An introduction notes recognition of traumatic brain injury (TBI) and its definition under the Individuals with Disabilities Education Act of 1990 as well as the increasing numbers of such students in the schools (as their survival rate increases). Typical causes and consequences of TBI at different age levels as well as categories of severity are considered in the next section. A typical recovery sequence following TBI is then discussed as are differences between TBI students and other students with disabilities. The following section stresses the importance of the school's role and educational interventions in helping such children gain reassurance that achievement is again possible. The major section on assessment addresses the following aspects: early intervention/coordination, nature of the assessment, the neuropsychological evaluation, neuropsychological assessment instruments, test observations, informal assessments/observations, assessment timing, other factors relating to assessment, and financial responsibilities. The final two sections look at implications for the recovering student and implications for school responses to recovering students. (Contains 23 references.) (DB)

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TRAUMATIC Brain Injury

The Role of Schools in Assessment

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Western Regional Resource Center
University Affiliated Program
College of Education
University of Oregon
Eugene, Oregon

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TRAUMATIC BRAIN INJURY:

The Role of Schools in Assessment

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TRAUMATIC BRAIN INJURY:

The Role of Schools in Assessment

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INTRODUCTION

What was once termed "the silent epidemic" by the National Head Injury Foundation is silent no more. As the number of students with traumatic brain injury continues to increase, the creation of a separate category for students with traumatic brain injury under the Individuals with Disabilities Education Act of 1990 represents a significant step toward increased awareness of the educational needs of students who have experienced brain injuries.

The creation of a separate category under IDEA represents a significant step toward increased awareness of the educational needs of students who have experienced brain injuries.

§300.7(b)(12) Traumatic brain injury

"Traumatic brain injury" means an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a child's educational performance. The term applies to open or closed head injuries resulting in impairments in one or more areas, such as cognition; language; memory; attention; reasoning; abstract thinking; judgment; problem-solving; sensory, perceptual and motor abilities; psychosocial behavior; physical functions; information processing; and speech. The term does not apply to brain injuries that are congenital or degenerative, or brain injuries induced by birth trauma.

Advances in medical technology and equipment, the speed of emergency care, understanding of injury and recovery, and training of medical personnel have allowed individuals to survive who would have otherwise died from

their injuries. "Survival is not without irony, however," Gerring & Carney (1992) note, as many patients are left with severe deficits. Although more individuals today may survive injury, "they do so at the cost of great compromise across a spectrum of physical and mental abilities and emerge from hospitals with severe problems that the community of educators, health workers, and families must address" (Gerring & Carney, Preface, p. x).

Because the survival rate for individuals who experience brain injuries is increasing, educators may be faced with challenges they have not encountered before. A student who was once healthy and self-sufficient may re-enter the public school system as a medically fragile stranger who is unable to walk, talk, or eat without assistance. Another once familiar student with no previous learning difficulties may return to school with numerous special learning needs. Still another student who has sustained a brain injury but has no obvious physical or cognitive deficit may return to school with a strangely altered personality.

A student who was once healthy and self-sufficient may re-enter the public school system as a medically fragile stranger.

To meet the educational needs of this growing population, school staff members will need to become more knowledgeable about Traumatic Brain Injury and sensitive to the special needs of brain-injured students. As parents continue to seek the least restrictive educational placements for their children and continue to advocate for their legal rights, public school systems face a greater responsibility than in the past to provide a wider range of educational programs both to students reentering the school environment and those

who are, at least temporarily, homebound or hospital bound (Begali, 1987, Introduction, p. xxi; Ylvisaker, 1991, Preface, p. xv).

Expanding the federal educational mandate to include traumatic brain injury carries the anticipation of more appropriate educational assessment, planning, and services for students with head injuries. A carefully planned, developed assessment is crucial to the successful reintegration of students recovering from traumatic brain injury. The responsibility of schools to conduct initial assessments for re-entering students as well as ongoing assessments to monitor the effectiveness of interventions and programming raises several concerns:

A careful assessment is crucial to the successful reintegration of students recovering from Traumatic Brain Injury.

1. How often should assessments be made?
2. Who is qualified to conduct assessments?
3. Who would be appropriate members of the assessment team?
4. What kind of evaluations, both formal as well as informal, are considered best, and what instruments are recommended?
5. Who bears the financial responsibility of these assessments?
6. How should evaluation results be interpreted?
7. What are the benefits of ongoing assessments for students as well as teachers?

SCOPE OF THE PAPER

This paper seeks to provide answers to these questions in order to provide guidance to states as they consider educational policies regarding traumatic brain injury and to schools as they begin making assessments. Drawing from the most current information published in the field, we have provided an overview of current educational issues that affect brain-injured students. More specifically, in this paper we have focused on the assessment process itself which plays such an integral role in the recovery progress of students with traumatic brain injury.

INCIDENCE/CONSEQUENCES

Increased mechanization and violence in American society have contributed to the growing numbers of young people who sustain traumatic brain injuries.

In the United States, an estimated 1,000,000 cases of head injury requiring hospitalization occur annually. The National Head Injury Foundation estimates that 50,000 to 70,000 individuals yearly are left with physical, cognitive, social and behavioral impairments that are severe enough to prevent them from returning to pre-injury functioning levels. Most individuals who survive head injuries are young adults between the ages of 15 and 34, but also many are children. Their injuries may produce long-term effects on learning and behavior that can affect their future development in several ways: 1) changing the course and rate of development; 2) reducing the ultimate level of skills achievement; 3) obliterating previously learned skills; and 4) affecting the development of new skills not yet learned at the time of the accident (Mira, Tucker, & Tyler, 1992, p. 9).

Head injury accidents vary in nature with different age groups. The major hazards for each population are listed in Table 1 (page 6).

The peak incidence of traumatic brain injury occurs in males between the age of 15 and 24, who constitute half of all brain injury cases. Increased mechanization and violence in American society have contributed to the growing numbers of young people who sustain traumatic brain injuries (Begali, 1987, p.13; Ylvisker, 1985, Introduction, p. xx).

TABLE 1. Major Hazards for Head Injury to Different Age Groups

INFANTS	TODDLERS & PRESCHOOLERS	SCHOOL-AGED CHILDREN	ADOLESCENTS & YOUNG ADULTS
• accidental dropping • intentional abuse	• falling • motor vehicle accidents, especially if not properly restrained by seat belts	• recreational and sports activities • automobile-bicycle accidents	• motor vehicle accidents • assault • recreational and sports activities

A brain injury alters the way a student perceives and processes stimuli as well as the way he or she interacts with the environment. Because one of the major impacts of Traumatic Brain Injury involves the ability to acquire new learning, a younger child is naturally at a greater disadvantage. But the organization and interconnection of a developing brain system continues at least through adolescence. Even a brain injury that occurs during late adolescence will affect a still evolving brain. Table 2 (page 7) offers general characteristics of head injuries sustained during different age periods (Mira, et al., 1992; Oregon, 1991, p.7).

Traumatic Brain Injury affects the ability of students to acquire new learning.

Traumatic brain injury results in widespread damage that affects both basic and higher level functions. In the Preface to Head Injury in Children and Adolescents, Begali (1987) writes:

Table 2. General Characteristics of Head Injuries as Sustained During Different Age Periods

Preschool

Children who are injured during the preschool years, even those with severe injuries, may appear to recover fully after the injury. They recover motor and speech skills, and often teachers and parents expect that they will develop and function normally in subsequent years. However, these children often develop academic problems when higher order skills and functions are needed. An IQ may be normal, but the child still has significant academic difficulties.

Early Elementary School

Early elementary school-age children have developing brains, and injuries producing a coma of 24 hours or more are likely to produce persistent intellectual difficulties.

While they respond well to school resumption, these children are likely to have difficulty as they progress through the grades. They are able to store and recall facts fairly well, but obstacles arise as they encounter demands for high level cognitive functioning. Even intelligence test scores may decline.

Early Adolescence

Head injury in early adolescence presents special problems for children and schools. Although a head injury at this age may not have such profound effects on intelligence as it does in younger children, the behavioral and emotional effects may be greater. At this age, students are very concerned about physical appearance and social skills. Head injury interferes with the developing sense of self. Loss of confidence and feelings of depression may lead to isolation from peers. Issues related to sexual development and impact of the injury on future psychosocial functions become important. Psychological counseling is generally needed for children in the older elementary and early adolescent years. Such counseling may be required for 2 to 3 years to help the child deal with the multiple psychosocial effects of the head injury.

If a child sustaining a TBI had behavioral or emotional impairment prior to the injury it is more likely that subsequent psychosocial adjustment will be significantly impaired.

Adolescence

Sustaining a TBI at adolescence has a significant effect on academic functioning. High school class work requires complex cognitive and reasoning skills that range from difficult to impossible for the student with TBI. Another problem may arise because adolescents are planning their future. The student is looking forward to finishing high school and getting on with the next step of life, which may mean higher education or a job. The student has been anticipating leaving high school and gaining independence from family. It is difficult for the student to accept the need to take time from school to recover from the head injury, or to delay graduation because of a reduced course load or a shortened day. When there are sufficient residual deficits to indicate special services within the school, it is better that the student delay high school graduation to use school services that would not be available after graduation. This, however, can be a very difficult step for a high school student to consider.

> Any number of physical, cognitive, or behavioral symptoms can result, giving rise to adverse educational consequences. Brain damage from head trauma can produce mild to major personality changes, varying degrees of intellectual deterioration, disinhibited social behavior, memory loss, sensory impairments, and/or persistent motor residua. Even the mildest forms of head injury can negatively impact a child's ability to concentrate, attend, process information, and remember. School performance and social functioning can be permanently altered. (p. xi)

The variety of behaviors and disabilities a student exhibits must be considered when planning for re-entry into the school environment. A student may exhibit disabilities ranging from mild to severe, which lack consistency and defy generalization based on performance in any one area (Blosser, & DePompei, 1989, p. 69). Behavioral and personality changes which often follow brain injury — either immediately or much later in some cases — can create greater difficulty in school adjustment for students than more obvious central nervous system problems (Telzrow, 1991, p. 25). Students with traumatic brain injury are also considered to be at high risk for psychiatric disorders which may interfere with educational interventions. Adjustment disorders are more common among adolescents than younger children because older students are able to comprehend that they have not regained certain pre-injury skills and feel frustrated by that loss (Shaw & Yingst, 1992, p. 260).

A student may exhibit a range of disabilities, from mild to severe, as well as behavioral and personality changes.

CATEGORIES OF SEVERITY

Although no standardized system has been developed for classifying severity of brain injury, the categories listed in Table 3, below (Mira et al., 1992, pp. 5 - 6) give generalized guidelines for educators.

Table 3. Categories of Severity of Head Injuries

The majority of brain injuries are **mild**. With these injuries there is no evidence of a skull fracture, but a concussion may result or symptoms such as dizziness or loss of consciousness may persist for less than an hour. Previously it was believed that mildly injured children recuperated quickly and suffered no long-term learning difficulties. We now recognize that even a mild injury results in both neurological and cognitive-behavioral effects that if not addressed, can lead to long-term academic and/or behavioral problems.

Loss of consciousness from one to 24 hours or a skull fracture constitute a **moderate** brain injury. Individuals with moderate brain injuries frequently require neurosurgery and may develop secondary neurological complications. Healing may take considerable time, and cognitive abilities may be impaired for a long period of time.

In **severe** brain injuries, individuals experience loss of consciousness for more than 24 hours, a contusion (bruising of brain tissue), or an intracranial hematoma (bleeding within the brain). Residual motor, language, and cognitive problems are common and cognitive deficits will persist that influence subsequent learning.

RECOVERY

Each individual who sustains a traumatic brain injury progresses through recovery in a different way, depending upon the site and extent of injury to the brain, the individual's age, and other possible complications. Numerous factors associated with the injury and the individual interact together, compounded by the fact that even prior to an injury, no two brains are identical. Outcome and speed of recovery are further influenced by availability and quality of medical care, rehabilitative and educational programs, each individual's own resources, and family attitudes (Begali, 1987, p. 48).

Recovery paths of individuals with traumatic brain injuries vary dramatically.

The recovery paths of individuals with traumatic brain injuries "can vary dramatically from individual to individual as can the ultimate level each person achieves" (Begali, 1987, p. 57). Most of the initial active motor and sensory recovery from a brain injury takes place during the first year following the injury. However, the recovery period for neuropsychological and psychiatric deficits may extend for several years following the initial trauma. It is these disabilties that represent the main barriers to resumption of a normal life (Gerring & Carney, 1992, p. 33).

In the past, it was assumed that once a patient completed the spontaneous recovery phase in the first few months following the injury, recuperation was complete. We now realize that individuals who sustain brain injuries can be helped to regain skills and progress beyond this phase as

their recovery continues over months or even years. A typical recovery sequence is outlined in Table 4, below (Oregon, 1991, p. 8). As the educational needs of students recovering from traumatic brain injury change, schools will continue to play an even greater role in the collaborative rehabilitation effort.

Table 4. Typical Recovery Sequence Following TBI

Motor	Gross motor functioning such as walking often improves more rapidly than other functions (within one to two months).
Sensory	These functions also improve relatively rapidly in children (within one to two months).
Speech	Communication skills, especially expressive speech may resolve within a few months, although more subtle language problems may persist indefinitely and unfortunately go unrecognized.
Measured IQ	IQ changes, particularly in mild head injuries may be relatively modest and appear to recover in the two months after injury. However, the change is usually not as rapid as motor, sensory and speech functions.
Memory and Attention	Difficulties in these areas may persist for many months after mild and moderate injuries and even longer in severe injuries.
Higher Level Cognition	Some functions may continue to be impaired for years, if not permanently. These include: information processing; learning under complex or difficult situations; and ability to function effectively and efficiently in novel situations. TBI children tend to be negatively affected by stress more easily than before.

Given the extensive range of possible learning obstacles students with traumatic brain injuries face, many may never fully recover to their pre-injury academic performance level and will need comprehensive, ongoing assessments, long-term monitoring, and individualized instruction. Some of these students will qualify for special education services, while for others the regular education classroom will remain the least restrictive environment. Students who remain in regular education classes may need creative approaches to instruction and individualized attention to remain there.

Educators should be aware of the differences between students with brain injuries and other students with disabilities in order to plan appropriate placement. As Blosser and DePompei (1989) point out, the student who has experienced a traumatic brain injury is not a peer of other students with disabilities. Unlike others, the injured student did not begin school with a disability; his or her disabilities have been acquired (p. 69). As a group, students who have sustained brain injuries typically have several distinctions (Blosser & DePompei, 1987; Blosser & DePompei, 1989; DePompei & Blosser, 1987; Rosen & Gerring, 1986; Ylvisaker, 1985). Among these are:

The student who has experienced a traumatic brain injury is not a peer of other students with disabilities, for his or her disabilities have been acquired.

HISTORY:

- a sense of being normal that persists from the premorbid period;
- a previous history of successful experiences in academic and social settings.

RECOVERY:

- inconsistent patterns of performance;
- variability and fluctuation in the recovery process, resulting in unpredictable and unexpected spurts of recovery;
- cognitive deficits that, although present in other handicaps, are more uneven in extent of damage and rate of recovery.

LEARNING STYLE/SKILLS:

- combinations of handicapping conditions that do not fall into usual categories of disabilities;
- a learning style that requires the use of a variety of compensatory and adaptive strategies;
- some intact high-level skills (making it difficult to understand why the student will have problems in performing lower-level tasks);
- a previously learned base of information that facilitates rapid relearning;
- more extreme problems with generalizing, integrating, or structuring information;
- discrepancies in ability levels.

BEHAVIOR:

- inappropriate behaviors that may be more exaggerated than the behaviors of students with other handicaps (e.g., greater impulsivity or distractibility);
- poor judgment and loss of emotional control, which cause the student to appear to be emotionally disturbed at times.

NEW CHALLENGES TO SCHOOLS

Now that we have overcome the challenges of how to medically treat traumatic brain injuries, we face challenges in treatment, rehabilitation, and research of the long term effects of brain injury, particularly in the areas of cognition and behavior (Bigler, 1990, Introduction, p. 6). Our public educational system has been given a key role in meeting that challenge.

It was once believed that there were no educational interventions that could help remediate learning and behavioral problems that resulted from physiological damage. Until recently students who sustained head injuries were routinely returned to community schools where there were minimal provisions for specific services and little awareness of their hidden impairments. Often classroom teachers were the first to detect learning problems in these students. Less fortunate students with brain injuries were placed in inappropriate institutions, segregated schools, and nursing homes.

Recent evidence indicates that educational interventions are among the most influential factors in recovery.

Until now, medical advances in the field of brain injury have occurred at a more rapid pace than our educational system's capacity to meet the complex developmental and educational needs of students with traumatic brain injuries (Utah, 1992, p. 3).

However, recent evidence indicates that educational interventions are among the most influential factors in

Schools have the distinction of being the most appropriate place for children to gain reassurance that achievement is possible again.

recovery and may play an even larger role in the recovery process than medical interventions (Shaw & Yingst, p. 256). Although some injuries are so severe that individuals may never return to their original levels of functioning, some degree of recovery is almost always possible and may be enhanced by educational interventions (Begali, 1987, p. 59).

Additionally, schools have the distinction of being "the most appropriate place for children to gain reassurance that achievement is possible again — even while being confronted with enormous new difficulties in thinking, remembering, speaking, reading or concentrating" (Gerring & Carney, 1992, Preface, p. ix).

ASSESSMENT

EARLY INTERVENTION/COORDINATION

The first several years following a traumatic brain injury "hold a concentrated potential for recovery," underscoring the critical importance of early intervention and appropriate rehabilitation and educational services (Begali, 1987, Preface, p. xi). Rehabilitation of patients begins while they are still hospitalized; educational services may begin there as well, or at home while students are still convalescing. Early intervention by a multidisciplinary team offers the best opportunity for recovery — medically, physically, cognitively, and psychologically (Oregon, 1991, p. 8).

Early intervention promises the best opportunity for recovery.

The first step for educators in the assessment process is to communicate with medical and rehabilitative teams to coordinate their evaluations of patients so that the evaluation results can be shared and used for multiple purposes; if this approach is adopted, students can be spared the stress of undergoing multiple assessments as they reenter school (Oregon, 1991, p. 8; Telzrow, 1991, p. 25).

As soon as school personnel become aware that a student's absence has been caused by a brain injury, a multidisciplinary team should be formed to begin coordinating assessment plans with the student's medical and rehabilitation teams as well as with the parents. The student's transition from hospital to community and eventually to

The student's transition from hospital to community and eventually to school may be viewed as a continuum along which the student, his family, rehabilitation professionals, and educators must all play an active part.

school may be viewed as a continuum along which the student, his family, rehabilitation professionals, and educators must all play an active part (Gerring & Carney, 1992, p. 87).

NATURE OF THE ASSESSMENT

The successful reintegration of students with brain injuries into the school environment requires a broad-based assessment that exceeds the scope of a typical psychological assessment. The need for such a comprehensive assessment is underscored by Ewing-Cobbs and Fletcher (1990) who emphasize:

> The wide range of neurobehavioral sequelae following head injury in children underscores the need for broad-based assessment of abilities. Neuropsychological assessment is crucial for maximizing adjustment to academic environments since even subtle changes in cognitive processing abilities may profoundly affect school performance. Reduction in intelligence scores may reflect changes in skills involving abstract reasoning, psychomotor speed, language usage, or sequencing. Difficulties in visual, motor, and visual-motor functions may lead to educational problems involving graphomotor activities such as writing and copying. Moreover, such difficulties often provide highly visible evidence to children for changes in their abilities. Attention and memory deficits clearly have major implications for the child's adjustment to the classroom. Although previously acquired information is frequently unaffected, learning and retaining new information may be quite disrupted. This often necessitates significant changes in the curriculum as well as modifications of child and family expectations for performance.
>
> (p. 111)

A carefully designed assessment systematically evaluates a wide range of behaviors and cognitive functions, both formally and informally. Because of the varied, specialized needs of students with brain injuries, the perspectives of a variety of professionals – including speech pathologists, occupational therapists, physical therapists, nurses, educational specialists and social workers — can make relevant contributions to the careful analysis of neuropsychological strengths and weaknesses (Telzrow, 1991, p. 29). The multidisciplinary team which coordinates the assessment process may be comprised of a variety of professionals such as these, but must include "at least one teacher or other specialist with knowledge in the area of suspected disability" (34CFR 300.532e). In many schools, this individual will be the school psychologist who has specialized training in neuropsychology.

Because of the varied, specialized needs of students with brain injuries, the perspectives of a variety of professionals can make relevant contributions to the careful analysis of neuropsychological strengths and weaknesses.

The neuropsychological assessment may be made by a school psychologist who has a neuropsychological specialization or through a consultive relationship with an educational center or medical facility with trained personnel (Telzrow, 1991, p. 29). The school may also hire a neuropsychologist in the community to serve on the assessment team. Regardless, careful consideration to the credentials and training of the individual conducting the assessment is important to assure the quality of the assessment. Although there are currently no definitive qualifications which those who administer neuropsychological examinations must meet, examiners should have completed

university level course work and formal training or supervised experience focused on neuropsychological assessment now offered by most Ph. D. clinical psychology and school psychology training programs (E. D. Bigler, personal communication, April 29, 1993).

Due to the changing nature of recovery from traumatic brain injury, optimal assessments should be periodic and ongoing; sometimes assessments may be necessary as often as every two months, depending upon an individual's recovery rate, but should be scheduled at least in six month intervals. Although a complete neuropsychological test battery may not be necessary, regular monitoring of each student's progress and evaluation of the effectiveness of current educational strategies are strongly recommended (Telzrow, 1991, p. 29). The slope of the recovery curve indicates if recovery through the natural healing process or rehabilitation is progressing as anticipated. A flat slope may signal the need to re-examine interventions (Shaw & Yingst, 1992, p. 259).

Due to the changing nature of recovery from traumatic brain injury, optimal assessments should be periodic and ongoing.

It is important that assessments utilize techniques and procedures that are in compliance with federal and state regulations for the education of students with disabilities. To be the most effective, assessments should incorporate a neuropsychological orientation, be multidisciplinary in nature, and include informal as well as more formalized evaluations (Telzrow, 1991, p. 28; Baxter, Cohen, & Ylvisaker, 1985, p. 250).

The assessment/reassessment of students who have experienced brain injuries should seek to:

- establish current, post-injury baseline levels and patterns of performance in order to monitor future recovery;
- describe the student's current functioning in critical areas and identify specific problem areas;
- identify existing abilities the student has retained which may help to compensate for deficits; and
- provide a means to evaluate recovery and monitor effectiveness of interventions
  (Mira, et al., 1992, p. 60; Telzrow, 1991, pp. 23-24; Begali, 1987, p. 97).

A comprehensive assessment should also reach beyond primarily determining academic performance levels and be used to help determine a student's learning style, response times, and cues that are effective to his or her individual learning patterns.

THE NEUROPSYCHOLOGICAL EVALUATION

A comprehensive neuropsychological examination is an essential assessment tool for beginning the post-injury education of a student with Traumatic Brain Injury.

A comprehensive neuropsychological examination is an essential assessment tool for beginning the post-injury education of a student with traumatic brain injury. A neuropsychological evaluation studies brain-behavior relationships and examines higher level cognitive processes such as intelligence, memory, and language. The assessment provides a comprehensive picture of all cognitive functions vital to learning. The assessment, moreover, should produce more than a simple diagnosis; it should "yield a prescription for services needed to address the remediation of the disability." This prescription may include insights to intervention, prognosis for recovery, and recommendations

for instructional strategy (Martin, R., 1990, p. 400).

The neuropsychological assessment may provide information in a number of domains, including:

- Cognitive/intellectual functioning
- Organizational skills
- Sensory and perceptual functioning
- Motor and psychomotor functioning
- Language comprehension and expression
- Visual spatial/constructional abilities
- Memory and learning
- Sequencing ability
- Academic achievement
- Attention, concentration, and alertness
- Problem solving, judgment, and abstract reasoning
- Social behavior

(Mira et al., 1992, pp. 60 - 61; Telzrow, 1991, p. 32; Baxter, Cohen, & Ylvisaker, 1985,.p. 254).

The assessment should consider the relationship of several factors interacting at once while the student recovers.

The assessment should consider the relationship of several factors interacting at once while the student recovers. On one level are the learning and behavior problems and basic core skills which are observable as well as measurable; on another level are the less obvious social, environmental, and motivational factors which affect a student's behavior and academic performance. On yet another level are the organic or neurological factors controlling recovery. Members of the assessment team need to consider each of these variables independently as well as study the varied ways they interrelate with one another to affect a student's recovery progress.

Yet another dimension of the assessment is the consideration of emotional distress caused by the trauma and how this affects recovery. A brain injury results in a distinctive form of stress since the very organ used to cope

with stress has been damaged (Parker, 1990, p. 228). The personality, mood and morale of the student are important components of the recovery process. A comprehensive assessment incorporates an "awareness of the emotional changes ensuing directly from brain damage, from the fright of the accident, and the stress of being injured and impaired" (Parker, 1990, p. 325). The examiner considers the student's diagnosis, stress-related emotional disturbance, mood, impulse control, morale, sense of identity, potential to lead a meaningful life, possible withdrawal, and individual view of the world. These considerations and observations are integrated and compared with other information gathered during the comprehensive evaluation (Parker, 1990, p. 346).

The personality, mood and morale of the student are important components of the recovery process.

NEUROPSYCHOLOGICAL ASSESSMENT INSTRUMENTS

The educational portion of a multidisciplinary evaluation traditionally assesses academic mastery, learning style, and school performance. A standard educational battery, however, may not include cognitive and behavioral domains that have been identified as important to brain injury. Thus, students with brain injuries often require a customized battery of appropriate assessments that identify specific areas of strengths and weaknesses unique to them (Gerring & Carney, 1992, p. 106). No one set of procedures will suffice for all students of a certain age. Examiners will adopt somewhat different approaches to assessment based on their clinical population, experiences, and personal

preferences as well as the appropriateness of possible procedures for the individual characteristics of the student being evaluated (Parker, 1990, p. 325). Since every assessment procedure has limitations, examiners are encouraged "to integrate information from many sources, and to make referrals where appropriate for further examination" (Parker, 1990, p. 319).

A common battery used to assess students with traumatic brain injuries is based upon the Halstead-Reitan tests, with variations appropriate for different age groups ranging from preschoolers to adults. Another common battery is the Luria-Nebraska Neuropsychological Battery, available in both adult and children's versions. Several experts have identified evaluation domains relevant to students recovering from brain injuries; however, no assessment instruments have been specifically validated for students with brain injuries.

No assessment instruments have been specifically validated for students with brain injuries.

Although practitioners may use different tests, their objectives and methods of interpretation are similar. The most important integrating concepts of an assessment are "the need for a wide range of exploration, recognition of the deficits found in diffuse brain injury, and attempt to use up-to-date procedures, concepts, and scientific findings" (Parker, 1990, p. 325). Although not exhaustive, a list of test instruments/ procedures sensitive to neuropsychological assessment domains is detailed in Table 5, page 24 (Oregon, 1991, p. 22). Many of these are available through Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, CA 90025-1251, telephone (310) 478-2061 or (800) 648-8857.

Table 5. Test Instruments/Procedures Sensitive to Neuropsychologic Assessment Domains

Domain	Illustrative Instruments & Procedures
Intelligence	Age-appropriate Wechsler Scale (WAIS-R, WISC-R, WPPSI-R) Differential Ability Scales (DAS) Kaufman Assessment Battery for Children (K-ABC) Stanford-Binet, 4th Edition Woodcock-Johnson Psycho-Educational Battery – Revised (WFPB-R): Tests of Cognitive Ability
Language Abilities	Aphasia Screening Test (AST) Clinical Evaluation of Language Fundamentals – Revised (CELF-R) Peabody Picture Vocabulary Test – Revised (PPVT-R) Test of Auditory Comprehension of Language – Revised (TACL-R) Test of Language Competence – Expanded Edition (TLC-Expanded) Test of Word Finding (TWF) Token Test for Children Contextual assessments such as language samples conducted in academic and nonacademic school settings
Visual-Spatial and Consturctional Performance	Constructional Praxis Tests Developmental Test of Visual Motor Integration Stanford-Binet, 4th Edition (Abstract Visual Reasoning Area) Contextual assessments such as samples of handwriting and art projects
Somatosensory and Motor Functions	Bruininks-Osteretsky Test of Motor Proficiency Finger localization Finger oscillation Purdue Pegboard Test Somatosensory tests Tactual Performance Test Contextual assessment such as observations in physical education and during ADL
Intelligence	Attention Deficit Disorders Evaluation Scale Connors Parent Rating Scale Connors Teacher Rating Scale Stanford-Binet, 4th Edition (Memory Area) Contextual assessments such as behavioral observations conducted in academic and nonacademic school settings
Achievement	Basic Achievement Skills Individual Screener (BASIS) Kaufman Assessment Battery for Children (K-ABC): Achievement Scale Kaufman Test of Educational Achievement (K-TEA) Peabody Individual Achievement Test – Revised Woodcock-Johnson Psycho-Educational Battery – Revised (WJPB-R): Tests of Achievement Contextual assessments such as informal and teacher-made tests in academic subject areas
Problem Solving and Abstract Reasoning	Category Test Tactual Performance Test Trail Making Test Wisconsin Card Sorting Test
Social Behavior	Child Behavior Checklist (parent and teacher forms) Vineland Adaptive Behavior Scale Contextual assessments such as behavioral observations in social or home settings

Adapted from *The School Psychologist's Perception on Testing Students with Traumatic Brain Injury*, Journal of Head Trauma Rehabilitation, v. 6, no. 1, March 1991. Reprinted with permission from Aspen Publishers.

The use of curriculum-based measurement and assessment methods allows educators tomake repeated assessments, evaluate the effectiveness of current interventions, identify specific academic weaknesses, and make immediate changes in the curriculum as needed.

Academic skills can be measured with curriculum-based measurement (CBM) and curriculum-based assessment (CBA). These methods use direct observation and recording of a student's performance in the local curriculum as a basis to make instructional decisions and help link neuropsychological assessment data to instructional programming. Both of these types of assessment offer a direct comparison of pretraumatic functioning to current levels of performance. The use of CBM and CBA allows educators to make repeated assessments, evaluate the effectiveness of current interventions, identify specific academic weaknesses, and make immediate changes in the curriculum as needed. These methods lead directly to academic interventions and can be modified to meet the special needs of students recovering from brain injuries (Shaw & Yingst, 1992, p. 259).

Personality changes and emotional stress experienced by the recovering student can be assessed through interviews with the student and his family members, checklists, records, clinical impressions, and projective testing. The Rorschach Inkblot Test, House-Tree-Person Drawings, and occasionally the Thematic Apperceptive Test are used to contribute information that may be unavailable because of the student's expressive limitations (Parker, 1990, p. 347). Individual interpretations of Rorschach inkblot images can reveal a student's attitude toward self, feelings about being impaired, and outlook toward the future, as well as indicate the presence of different emotional states (Parker, 1990, p. 423).

TEST OBSERVATIONS

The strategies that students use to derive answers are often as important to the assessment process as their test scores. In a testing situation, Baxter, Cohen and Ylvisaker (1985) emphasize, it is as important to observe how students arrive at their answers as it is to record their answers. The test examiner should observe the following possible reactions and integrate observations with all the other facets of the assessment:

The strategies that students use to derive answers are often as important to the assessment process as their test scores.

BEHAVIOR:

- anxiety reactions: excessive yawning, inappropriate or off-task comments, unpredictably delayed responses, repeated requests for assistance or clarification, resistance or refusal to respond
- attention, distractibility, and orientation in relation to the kind of task presented
- flexibility: adjustment to changes in content, format, and response modes
- fatigue and its possible medical, emotional, attentional, or task-oriented causes
- confusion of past and present, reality and fantasy
- ability to work under stress: tolerance for the testing situation in general and for timed tests in particular

SKILLS :

- ability to retain and use information learned in the testing situation
- indications that information not known now was known previously (e.g., refusing or resisting tasks, or statements such as "This is easy," or "I used to know that")
- awareness of present capabilities
- consistent or inconsistent performance
- spontaneous use of strategies
- performance rate related to type of task and type of response

RESPONSES:

- delayed responses that represent either effective processing time or generally slow performance patterns
- purposeful or nonpurposeful repetition of information
- associations to information that indicate comprehension, lack of comprehension, or poor attention
- inadequate responses or responses not given and the potential for using different modes of presentation that might elicit more appropriate answers
- samples of conversation and language expression that are appropriate, confabulatory, disruptive, or evasive
- perseverative responses
- response to content that is familiar or unfamiliar, concrete or abstract, visual or auditory
- differences in oral, written, and gestured and manipulative responses
  (Baxter, Cohen & Ylvisaker, 1985, p. 267-268)

The results of an evaluation can be misleading if not interpreted with caution.

Despite the broad range of abilities assessed during a neuropsychological evaluation, Ewing-Cobbs and Fletcher (1990) warn that the results of an evaluation can be misleading if not interpreted with caution:

> Since previously learned information is often less affected by cerebral trauma, assessment focusing on overlearned abilities such as reading may underestimate the severity of information processing difficulties. These difficulties may be apparent on tests involving abilities such as attention and the acquisition of new information. Most evaluations provide estimates of a child's optimal, rather than typical, level of functioning. If this factor is not accounted for, predictions of the child's functional abilities at school and in the community may be quite inflated.
> (p. 120)

Because the evaluation instruments currently in use are not normed for students with brain injuries, results can provide guidance for placement and educational strategies, "but cannot be considered definitive" (Gerring & Carney, 1992, p. 109). Each finding should be analyzed in relation to the broad range of abilities affected by a brain injury, the pre-injury skills of the student, and the unique set of strengths and needs of each student (Gerring & Carney, p. 111).

INFORMAL ASSESSMENTS/OBSERVATIONS

Informal assessments should be incorporated in comprehensive evaluations whenever possible. Family members' perspectives are valuable because they observe the student in a wider variety of settings, including the less-structured home environment. They can also identify problems that may not present themselves in formal testing sessions.

Family interviews can help to create a more detailed picture of the student as an individual with social and emotional needs.

Family interviews can also provide valuable information about pre-injury functioning of the student. The student's interests, hobbies, extracurricular activities, and peer group associations should be a part of the assessment process to supplement academic performance data. Such information helps to create a more detailed picture of the student as an individual with social and emotional needs. Parker (1990) recommends that the parent interview cover the following areas: pre-birth and birth information, developmental patterns, cognitive development, education, study patterns, pre-trauma health, information about the accident, changes in

personality following the accident, and a general overview of the effect of the accident on their son or daughter (pp. 415-418). More formal behavior assessments such as the Vineland Adaptive Behavior Scales, the Child Behavior Checklist, and the Personality Inventory for Children can be used as supplements to informal interviews to assess behavioral sequelae of brain injuries (Ewing-Cobbs, 1990, pp. 119-120).

Living with a child who is experiencing dramatic physical, cognitive and emotional changes can be devastating to even a stable family system.

Living with a child who is experiencing dramatic physical, cognitive, and emotional changes can be devastating to even a stable family system. Often family members must adjust to the new identity of their son or daughter while they are needed to assist professionals in the rehabilitation and re-education of their child. This complex process of adaptation may be extremely difficult for the family and require "a form of rebonding or reconnecting with the postinjury child" (Martin, D., 1990, p. 387).

A recommended assessment instrument for evaluating family relationships is the Family Environment System (Moos, 1974). This instrument provides valuable information about the interpersonal relationships of family members as well as the structure of the family system and the home environment (Shaw & Yingst , 1992, pp. 261-262).

Informal observations of students interacting in natural environments such as playgrounds or parks can also be valuable aids to compiling a detailed and accurate picture of the recovering student (Telzrow, 1991, p. 29).

ASSESSMENT TIMING

No precise guidelines exist for the timing of assessments since individual circumstances may determine the appropriate time. In general, the initial assessment should be made as close as possible to the anticipated time of the student's reentry into an education program.

Experts warn that testing during a period of rapid recovery can produce unrealistic expectations. The continuation of periodic, ongoing assessments that identify changing patterns of strengths and weaknesses carries the greatest assurance of the most accurate and meaningful evaluation results.

Another precaution regarding timing of assessments concerns making predictions based upon performance at one age to a later time period. For students who have experienced a traumatic brain injury, available assessment measures cannot be used to predict performance in future developmental stages. Students who perform adequately during one stage of development may experience difficulties in future stages. For this reason, basing educational interventions on the student's most current assessment is necessary (Telzrow, 1991, p. 25).

The continuation of periodic, ongoing assessments that identify changing patterns of strengths and weaknesses carries the greatest assurance of the most accurate and meaningful evaluation results.

OTHER FACTORS RELATING TO ASSESSMENT

An array of medications may be prescribed for medical and psychiatric problems caused by traumatic brain injury. The side effects of these medications can affect a student's performance during assessment. Educators should know

what medications a student is currently taking and consider their possible effect on performance during the assessment process.

It is not uncommon for students who have experienced traumatic brain injuries to have motor sequalae such as spasticity and ataxia following an injury. These may affect selection of evaluation tools as well as require modifications in test administration. Special accommodations in the physical setting of the evaluation, as well as the manner in which assessment is conducted, may need to be made. These modifications should be documented for replication during future assessments and should be considered when interpreting evaluation results (Telzrow, 1991, p. 26-27).

FINANCIAL RESPONSIBILITIES

Schools are responsible to provide medical services for diagnosis or evaluation purposes as related services.

Under the Individuals with Disabilities Education Act, schools are required to provide "medical services for diagnostic or evaluation purposes" as related services to form the basis of educational programming. Although this does not mean that schools must be responsible for all of a student's medical bills, "the school clearly is responsible for sufficient medical diagnostic work to form the basis for a program and also for the therapies and other related services needed in order for that program to confer reasonable educational benefit" (Martin, R., 1990, p. 400).

A complete neuropsychological examination is time consuming and therefore, may be expensive. Parker (1990) estimates that an initial examination of a student with a

traumatic brain injury may take seven hours with one hour reserved for parent interviews. As ongoing re-evaluations are necessary for recovering students, schools must provide these as well as specialized services which may be prescribed for the student such as skilled nursing care in the classroom, physical therapy, occupational therapy, speech therapy, and counseling. Specialized equipment may also be necessary. Additionally, because injured students may be unable to physically return to the classroom on a full time basis for a period of time, schools are responsible for providing alternative educational services to the traditional school environment, including such options as hospital instruction, home instruction, a combination of home and school instruction, a reduced-day program, or a modified school program (Martin, R., 1990, pp. 400-401; Gerring & Carney, 1992, pp. 76-77). Some brain-injured students may require educational services beyond the traditional school calendar; still others may require residential placement. All of these alternatives should be considered when results of the assessment are analyzed.

It is the responsibility of schools to provide ongoing re-evaluations as well as specialized services students may need.

IMPLICATIONS FOR THE RECOVERING STUDENT

When all parts of the assessment have been made, the multidisciplinary team determines the eligibility of the student. This can be documented in the student's permanent record with a "Statement of Eligibility" similar to that shown in Table 6 on page 34 (Special Education Forms, 1992, App. C). Recommendations for educational interventions can be made that most accurately reflect the needs and potential outlook for the recovering studen' If a comprehensive assessment is made before a student re-enters the school environment, both the student and teachers benefit. The student returns to a program that is appropriate for his or her individual learning needs. In a similar way, teachers are aware of both the student's strengths and potential areas of learning difficulties and can design a program to accommodate those needs.

With the recent advent of comprehensive treatment programs and more individualized education programs, the long-range prospect for students recovering from brain injuries looks more encouraging than ever before. The realization that recovery continues even after the initial phase offers educators the opportunity to play an instrumental role in the recovery process of these individuals. A comprehensive assessment such as we have outlined in this synthesis paper can be the guiding force that determines the shape a student's educational program will assume and is thus a vital, initial step in the student's eventual recovery.

The long-range prospect for students recovering from brain injuries looks more encouraging than ever before.

TABLE 6. Sample Statement of Eligibility

Date Initiated by District _____
Mo Day Yr

Statement of Eligibility — Traumatic Brain Injury

Student Name _____ Birth Date (mo/day/yr) _____

School _____ Grade _____

☐ The multidisciplinary team has determined that the above-named student **is not eligible** for special education in the category of traumatic brain injury.

☐ The multidisciplinary team has determined that the above-named student **is eligible** for and **needs** special education in the category of traumatic brain injury. The determination is based upon both of the following eligibility requirements:

☐ The student had a traumatic brain injury which adversely affects educational performance and requires special education.

☐ The condition is permanent or is expected to last for more than 60 calendar days.

Disability: ☐ Primary ☐ Secondary

Signatures of Team Members	Title	Agree	Disagree
_____	_____	☐	☐
_____	_____	☐	☐
_____	_____	☐	☐
_____	_____	☐	☐
_____	_____	☐	☐
_____	_____	☐	☐

Date initial eligibility established _____ Date eligibility re-established _____

Attachments:

☐ Psychological test results (required)
☐ Motor test results (required if student exhibits motor impairments)
☐ Speech/language test results (required if student exhibits communication disorders)
☐ Observation reports (2 required)
☐ Adaptive behavior test results (required)
☐ Pre-injury performance information (required)
☐ Physician's statement (required)
☐ Psychosocial test results (required if student exhibits changed behavior)

cc: Student File

Form 581-5148O-X (New11/92)

IMPLICATIONS FOR SCHOOL RESPONSES TO RECOVERING STUDENTS

As increasing numbers of school-aged children and youth are surviving traumatic brain injuries and returning to school, educators are challenged to provide appropriate services and educational interventions. This challenge has been given greater emphasis and possibility with the designation of traumatic brain injury as a separate category under the Individuals with Disabilities Education Act of 1990.

Recent evidence indicates that educational interventions are among the most influential factors in recovery following a brain injury, and schools are ideal settings for students to regain the assurance that they are capable of learning again.

Successful reintegration of recovering students into the school environment requires a comprehensive assessment which evaluates a wide range of behaviors and cognitive functions and carefully analyzes students' strengths and weaknesses.

Successful reintegration of recovering students into the school environment requires a comprehensive assessment which evaluates a wide range of behaviors and cognitive functions and carefully analyzes students' strengths and weaknesses. Assessments should use techniques and procedures in compliance with federal and state regulations, be multidisciplinary in nature, incorporate a neuropsychological orientation, and include both formal and informal evaluations. The cost of these evaluations as well as related services needed by the student to participate fully in the educational process must be borne by the school system.

Students recovering from Traumatic Brain Injury

require a customized battery of appropriate assessments that identify specific strengths and weaknesses unique to students with brain injuries. Although experts have identified evaluative domains relevant to students with brain injuries, no assessment instruments have been specifically validated for these students, so results must be interpreted with caution.

Informal evaluations, including interviews with family members, and observations in natural settings can help create a more detailed picture of the brain-injured student as an individual.

A comprehensive assessment made close to the time of re-entry ensures that recommendations for educational placement and programming accurately reflect students' individual needs and potential for recovery. Subsequent assessments conducted on a periodic and ongoing basis further monitor recovery and effectiveness of interventions as the student progresses through the school system.

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